BigBite Wire Chamber Hardware & Software Progress Report

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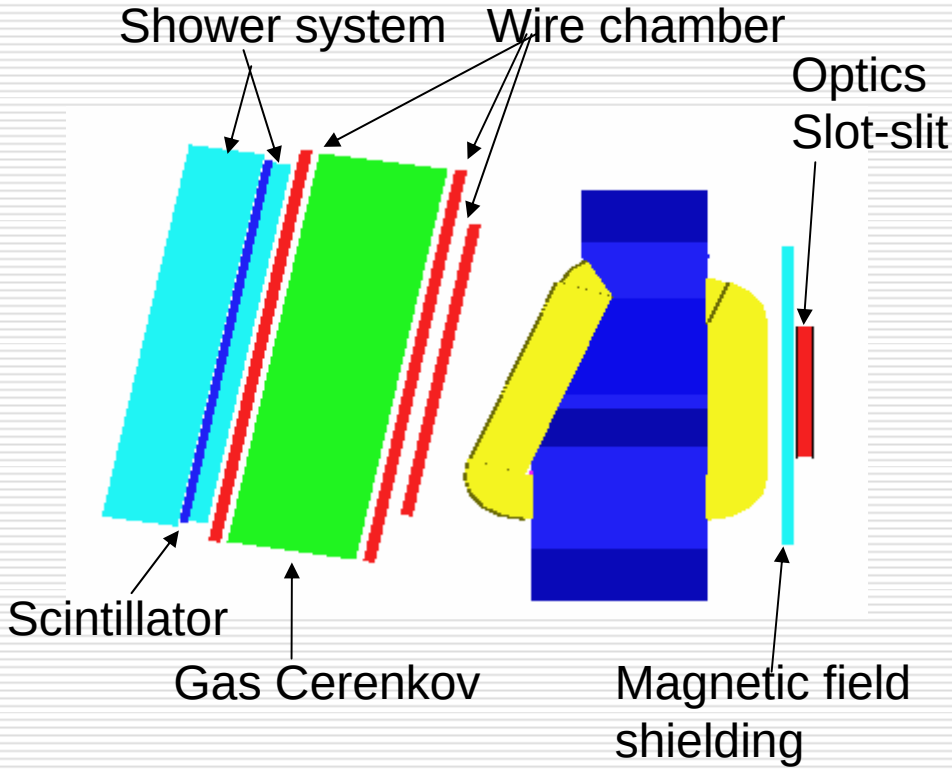
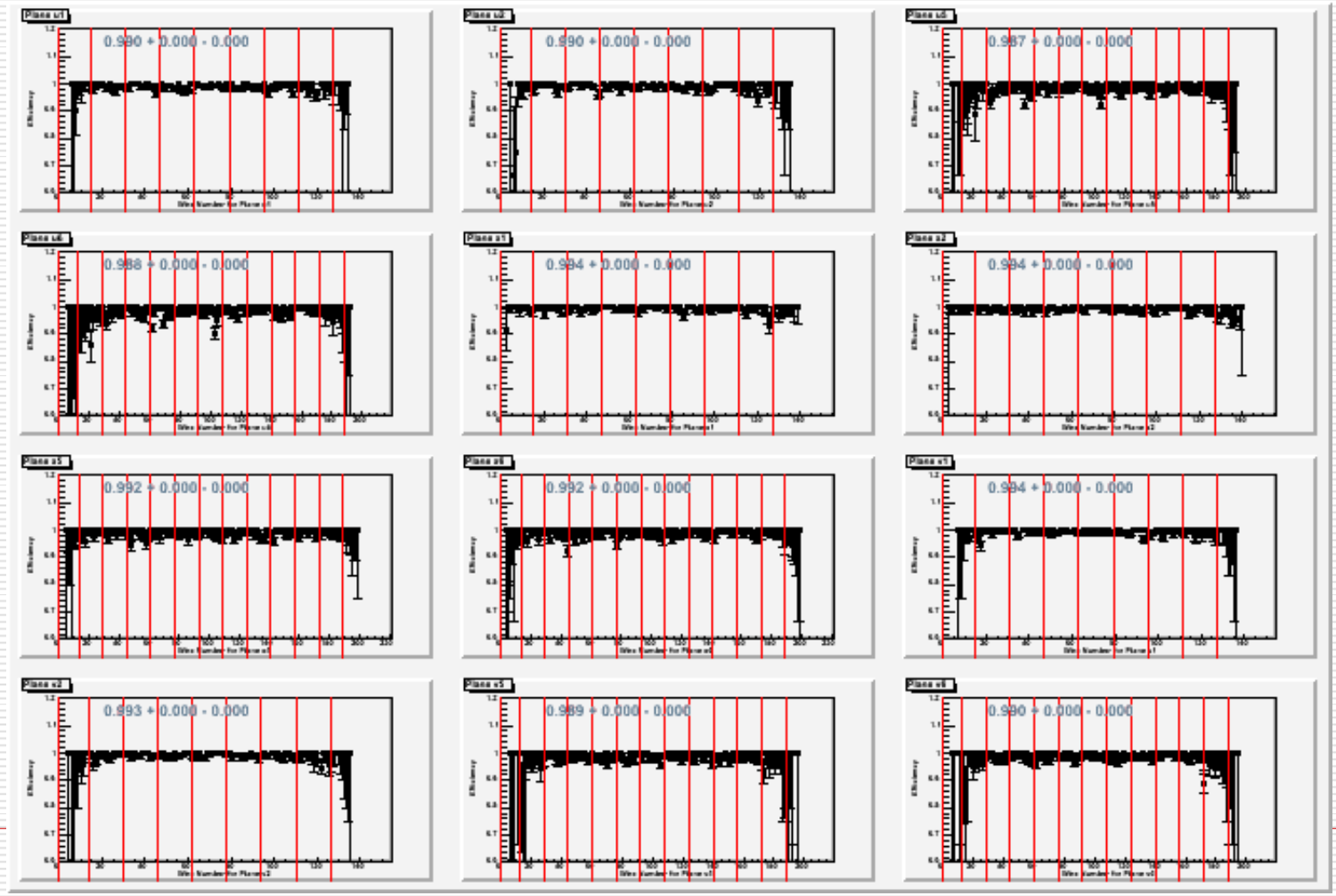


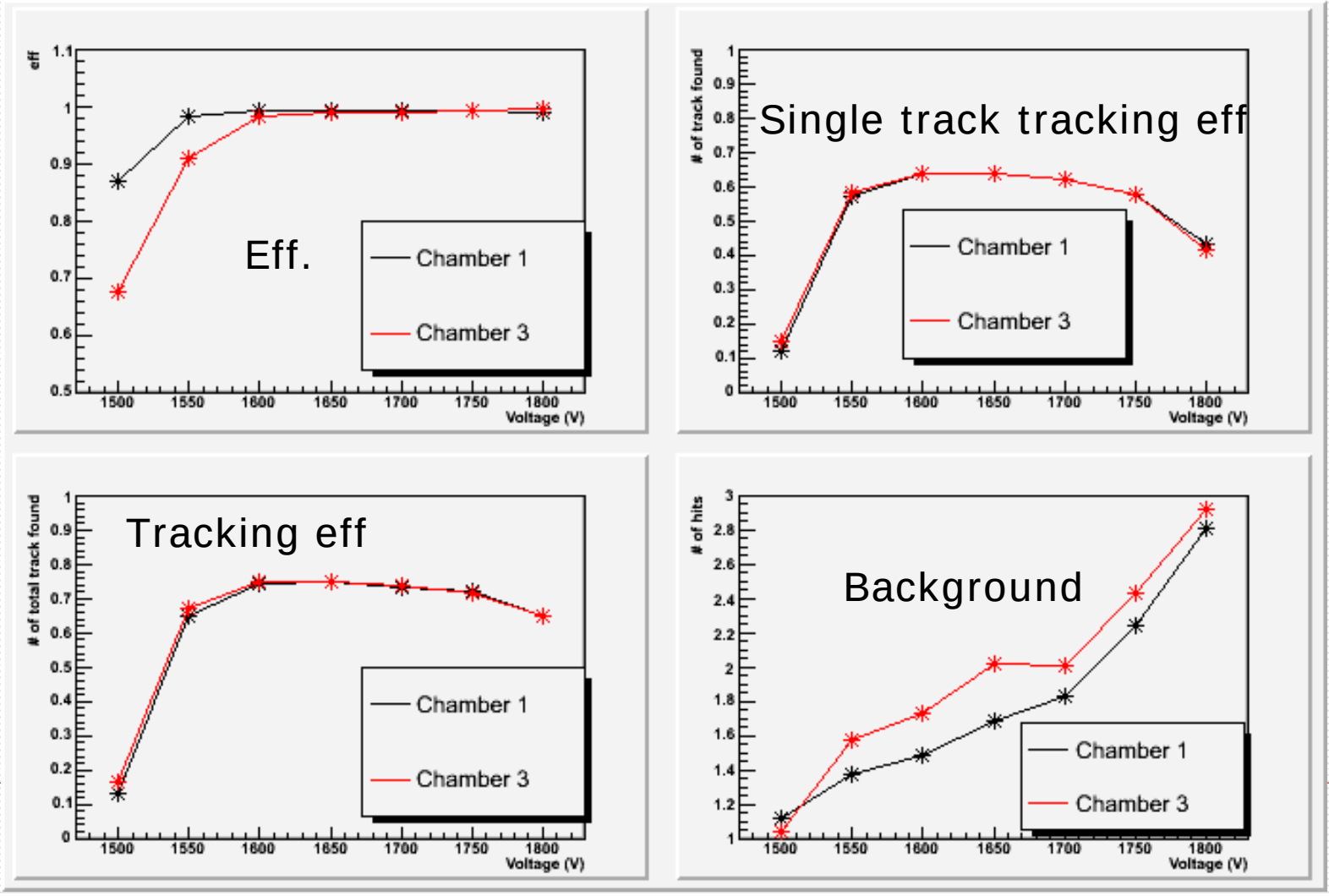
Outline

- Chamber 1 + Chamber 3 Test : Done
- Chamber 1 Status
- Chamber 2 Preparation Work List
- BigBite Wire Chamber MC Progress
- Conclusion
- Future Work

Chamber 1 + 3 eff



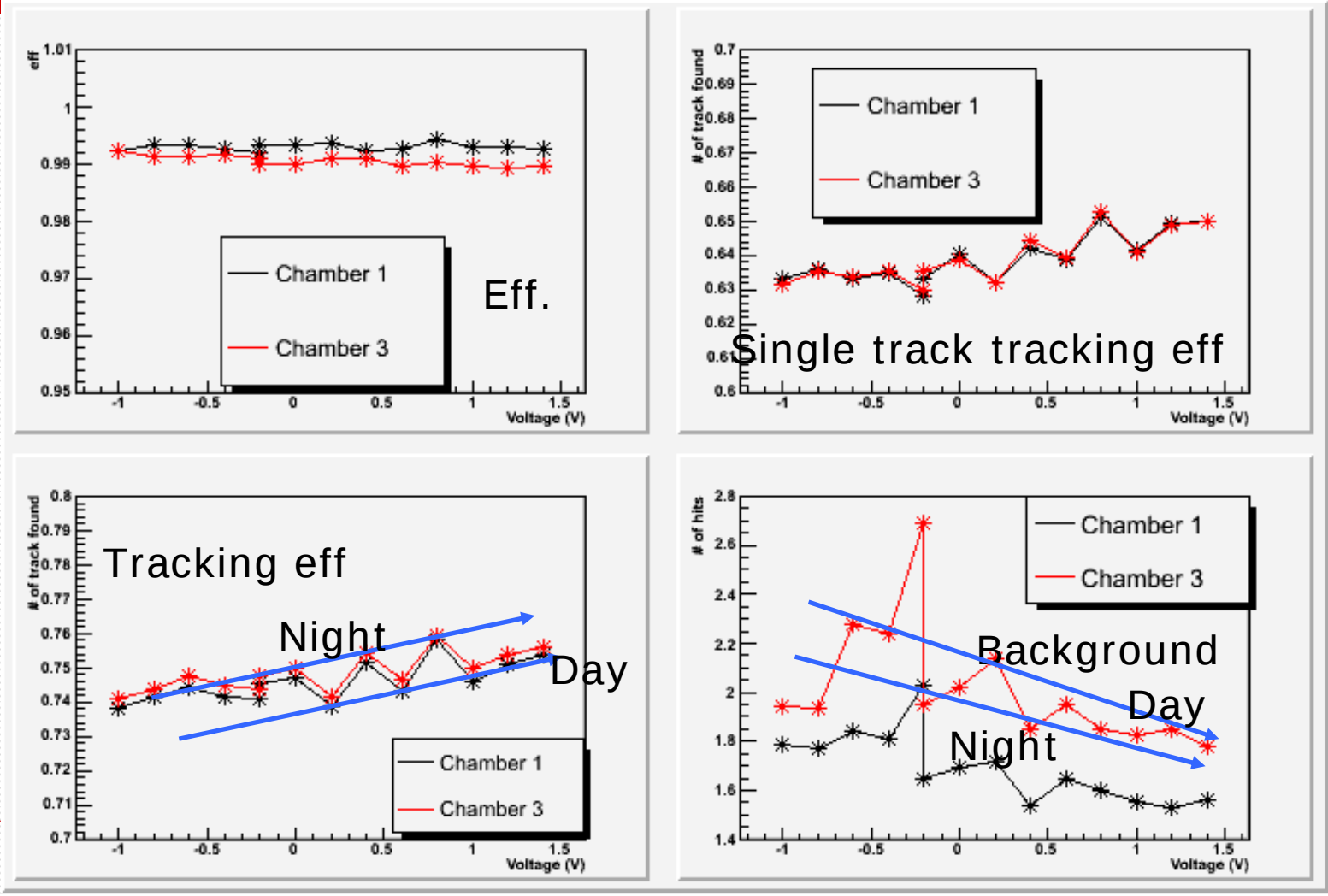
Chamber 1 + Chamber 3
HV scan: Done



HV Scan: Conclusion

- Threshold fixed at 3.0 V (4.4 V) for chamber 1 (3).
- Best running condition 1650 V.
- Real tracking eff = (Hardware tracking eff) * (Software tracking eff)
  - Hardware tracking eff due to wire hitting efficiency.
  - Software tracking eff due to Software limitations.

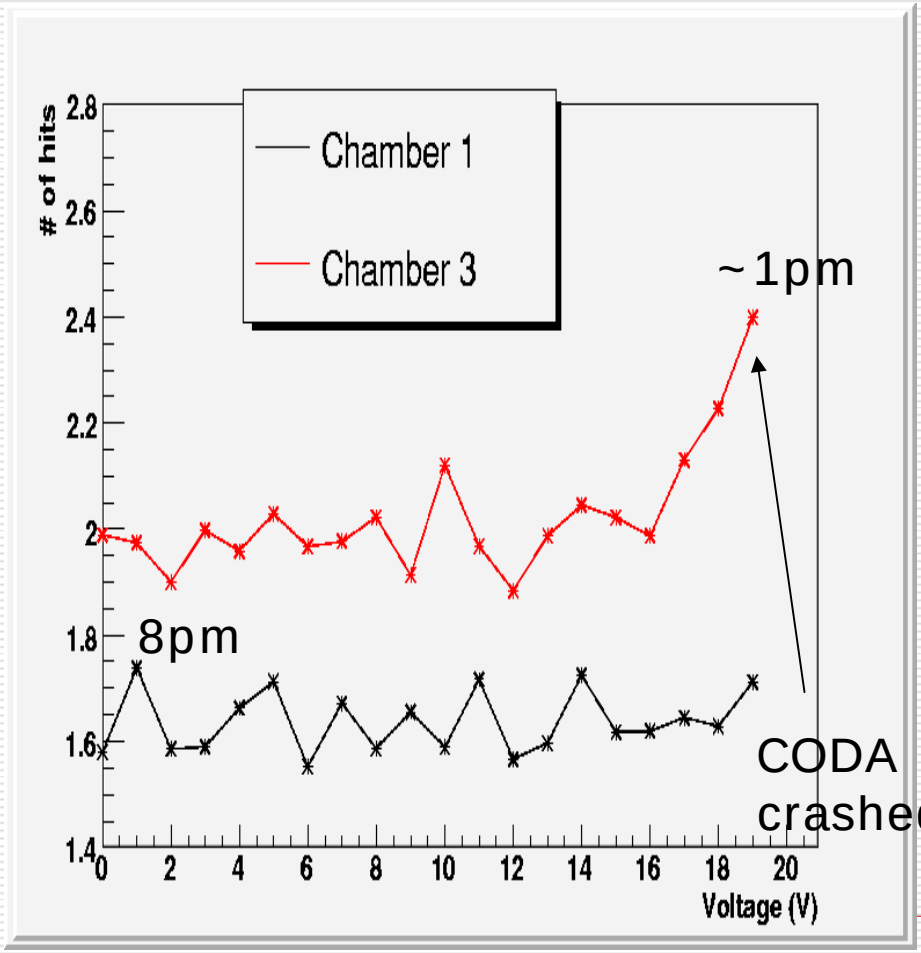
Chamber 1 + Chamber 3
Threshold Scan: Interesting structure

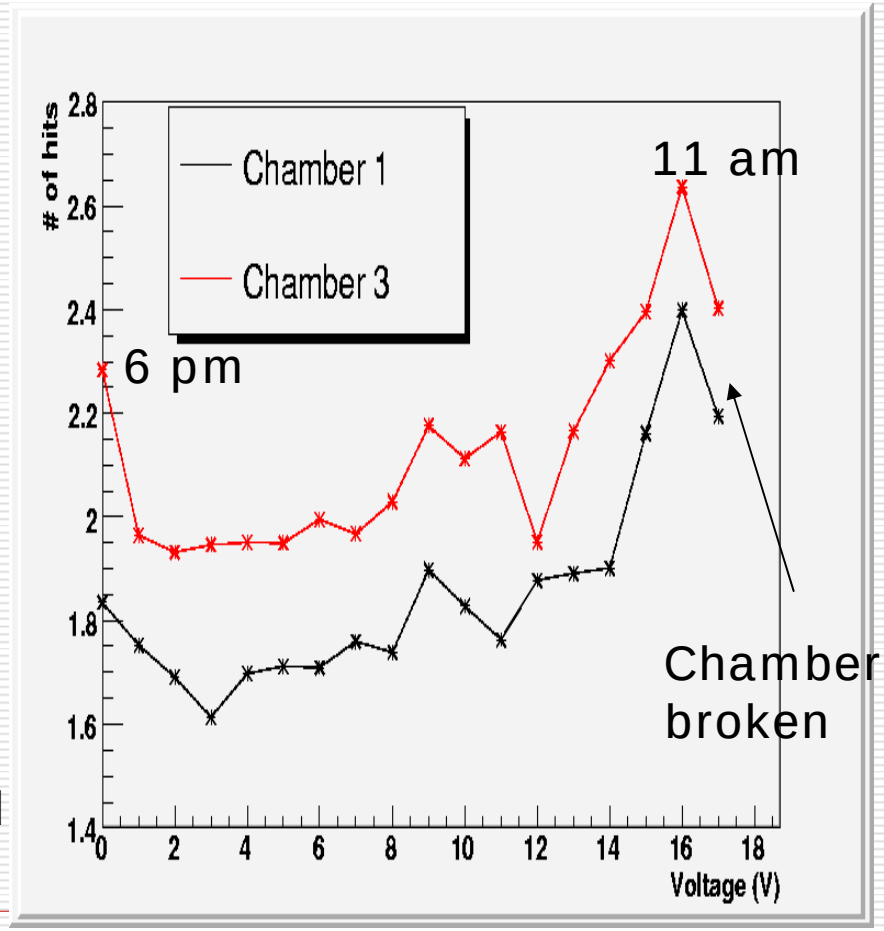


Threshold Scan: Conclusion

- All variables are not sensitive to Threshold Scan.
- Trend make sense.
- It is safe to stay in the middle (not too high or too low).
- Interesting time dependent structure.

Time Dependent Study





Chamber-1 Status

- At least one wire is broken inside chamber-1 (v2 plane can not hold HV).
- Two cathode plane can not hold HV due to the broken wire in v2.
- Have to disable two planes if happened in real experiment.
  - Not difficult to do.

Chamber-2 Preparation Work List

- Almost done with all the ribbon cables.
  - 210 (256) 25 feet short cables (From level translator to FASBUS): done
  - 39 (64) 100 feet long cables (For new 3 planes of Ch2): ~ 10 more to go
  - H. Yao and I are in charge of this.
  - Thanks to Doug, Ida, Emily, Scott, ...
- Still short cables from Amplified card to patch panel 39 cables.

Chamber-2 Preparation Work List

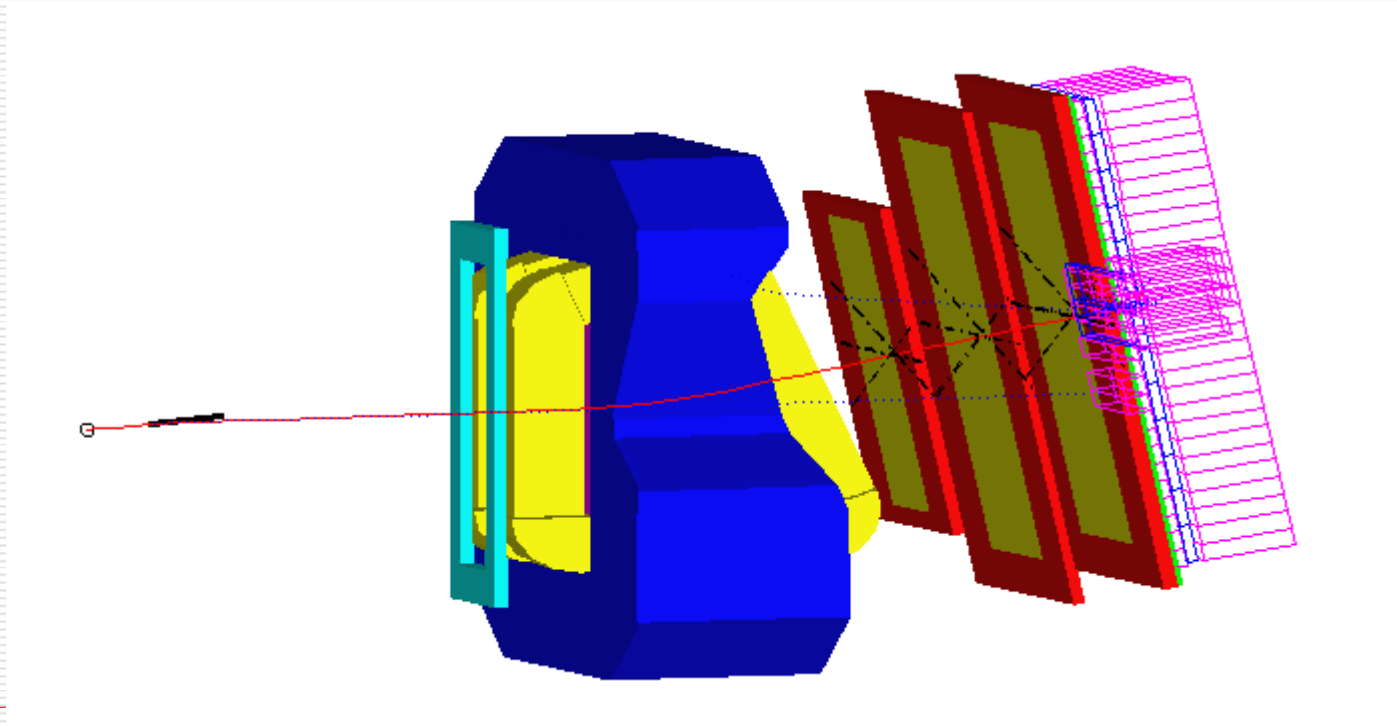
- Make Low voltage connectors.
  - Modify power lines
- Install 4 patch panels at detector side.
- Need 4 more level translators.
- Set up threshold power supply.
  - Controlled by computer?
- Set up two storage shelves.
- Set up two storage cabinets.
- Need more amplified cards
- Redo the HV lines, patch panel, HV boxes
  - Try to separate all planes.
- Software is straight forward
- Set up cable supporter at FASTBUS.
- Group the new flat cables
- Mapping for 3 chambers at FASTBUS
- In summary, more man-power are needed. Volunteers are very welcome.

BigBite Tracking MC Procedure

- MC event generator
- Fortran program to extract information from COMGEANT output
- “h2root” to convert into ROOT format.
- “addbg” to add all need features (eff, background etc), pack data in ROOT format.
- “BBWCsim” to provide interface with analyzer
- Fake data can be analyzed using analyzer as real data. (Now support 15/18 planes)

COMGEANT MC

- MC using COMGEANT (GEANT3) Program.

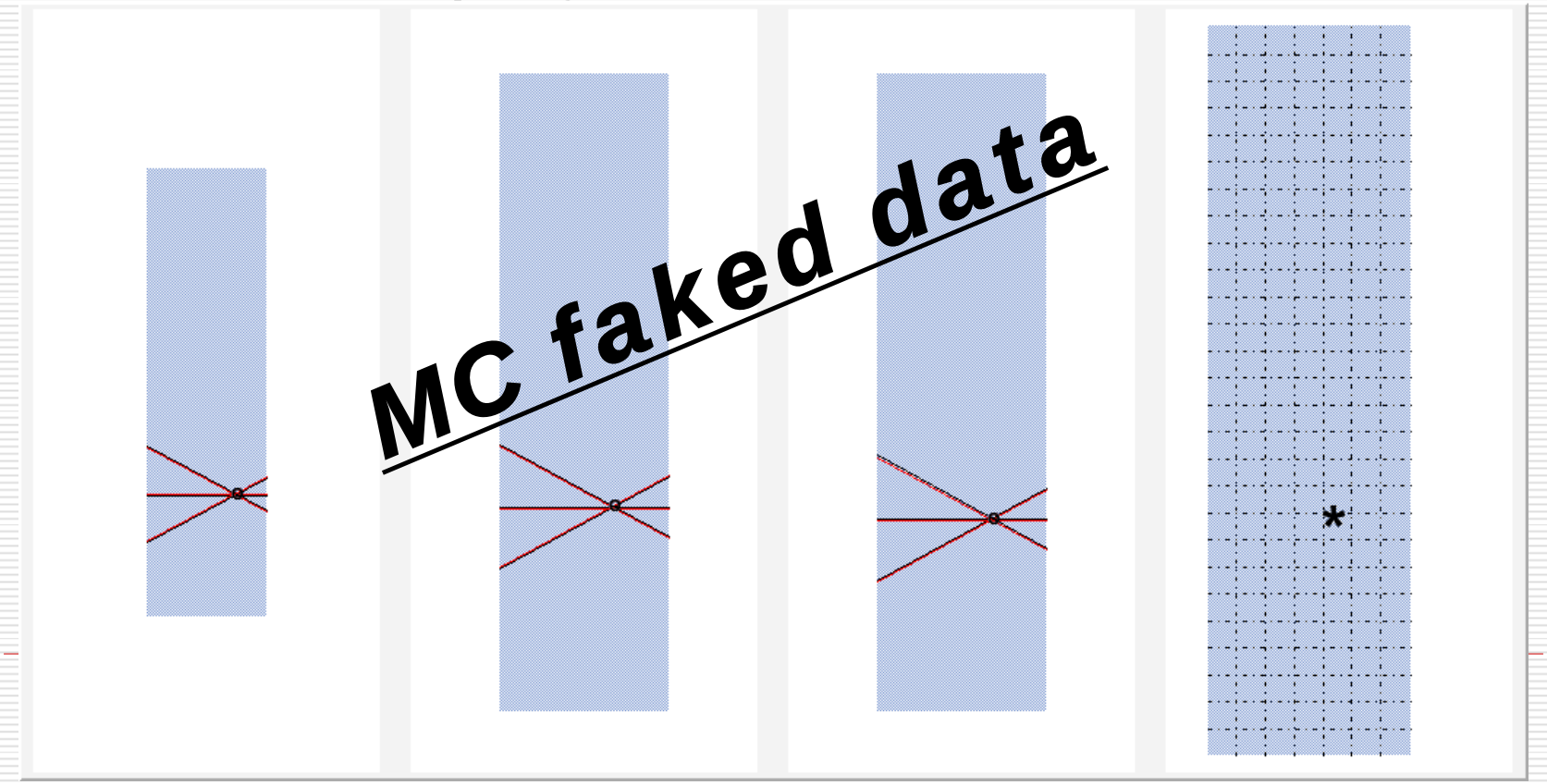


COMGEANT MC

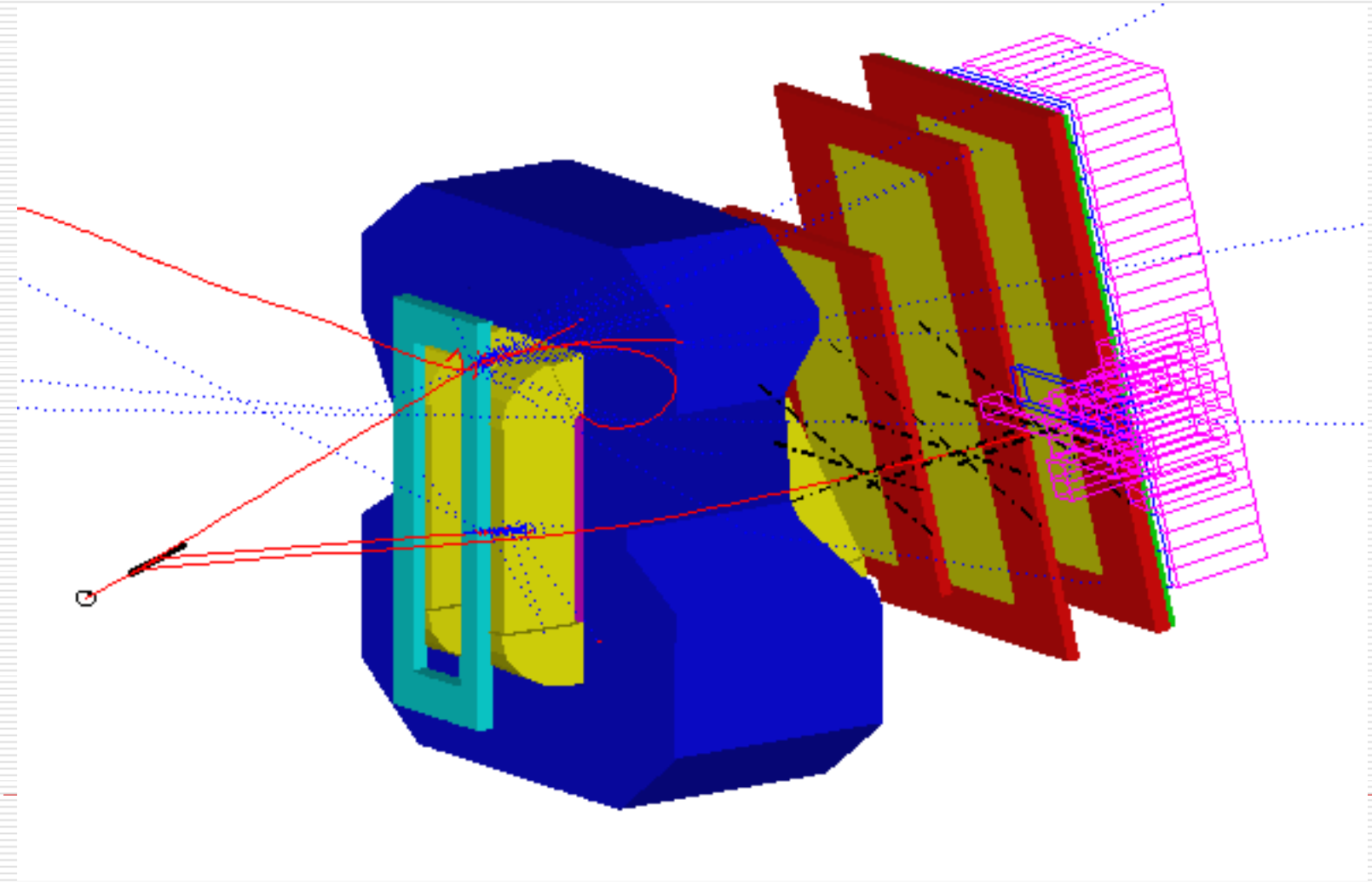
- Digitization are included
  - No pre-shower sum, shower sum implemented
    - Can be done
  - No TDC information for scintillator (do not need)
    - Have ADC information
  - No Gas Cerenkov implemented
- Output: Paw ntuple with coded info.

Additional software

- T0 program to get t0,
- Event display

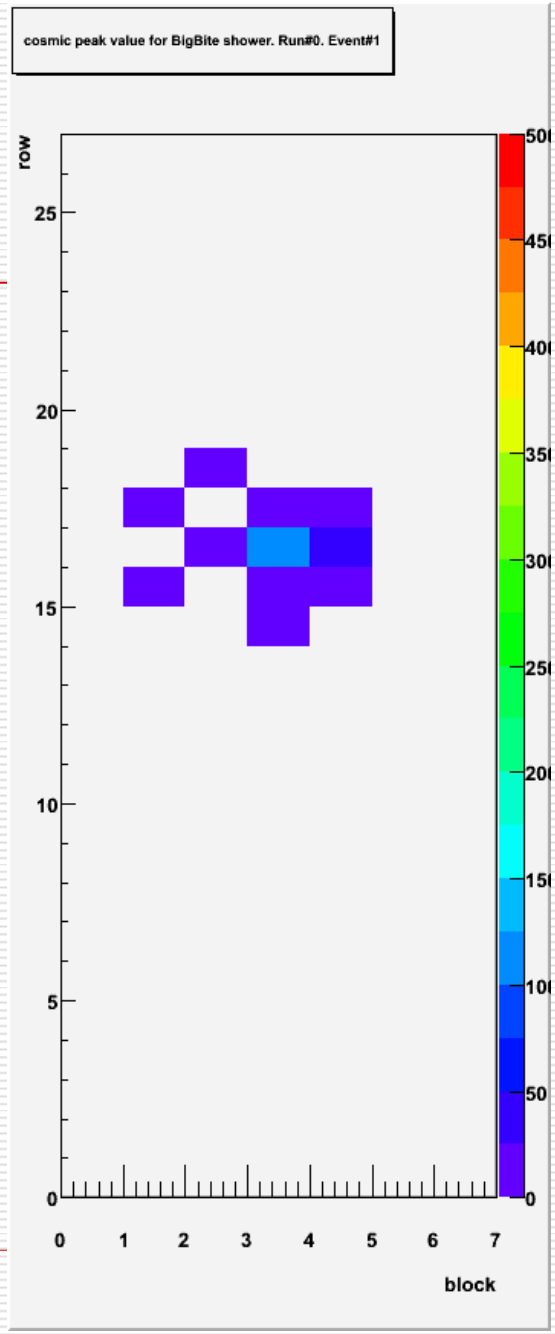


Comparison Plot from Comgeant



Additional software

- Shower event display (Kalyan).
- Faked data are same as the real data, except for scintillator TDCs.
- Preshower and shower sum can be added.

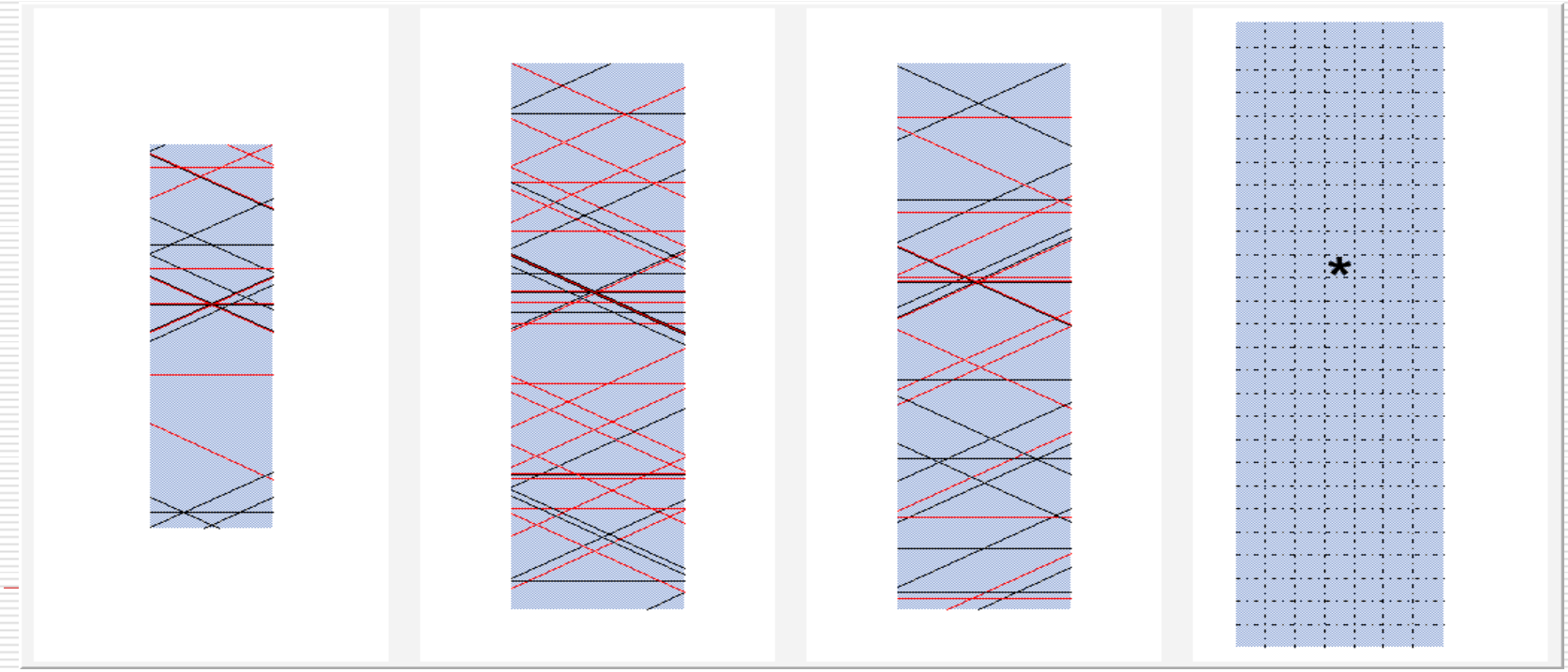


What we can do with tracking MC?

- MC is a very powerful tools
- Help evaluate/develop tracking algorithm
- Set the running luminosity limit
- Optimize detector setup.
- Test developed software.
- Future analysis etc ...

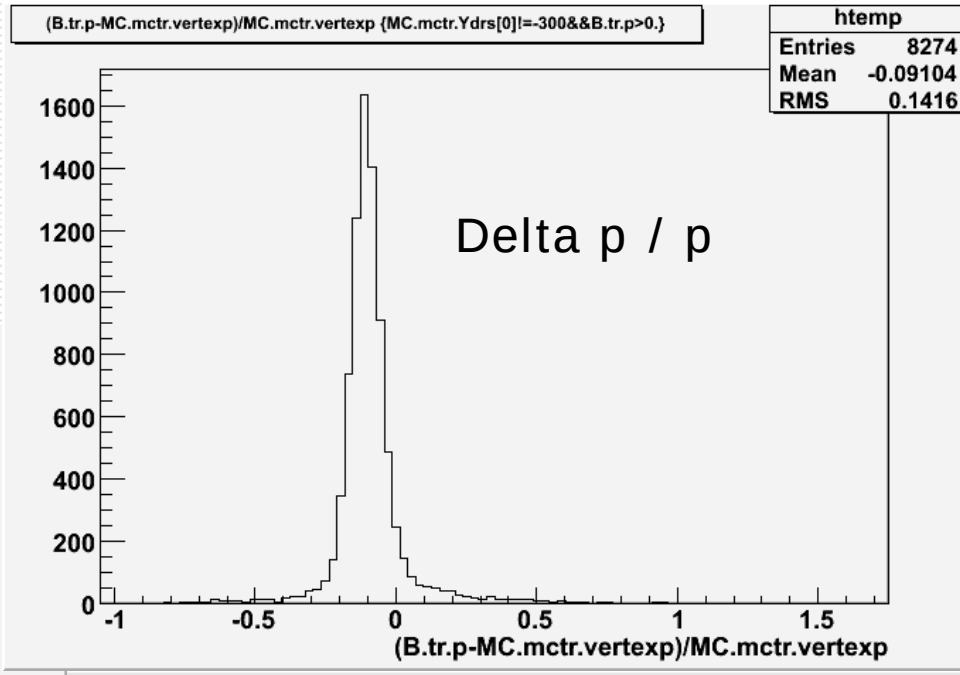
Question: What will our real data looks like? (sample plot)

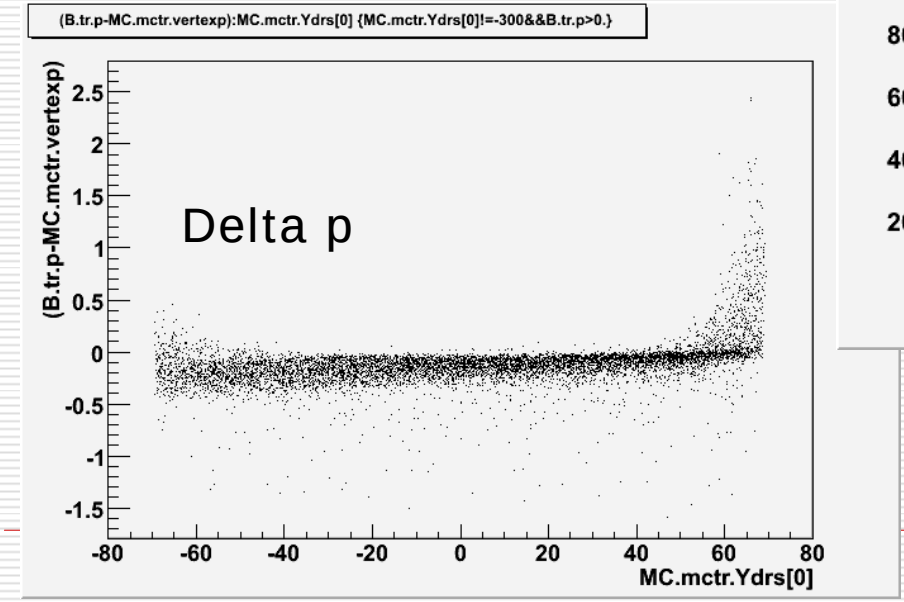
- Assume 15 uA beam at transversity situation: 20, 23, 23 MHz at three chambers. (within 200 ns)



A powerful tool for optics study

- Wide momentum coverage
- Field edge effect

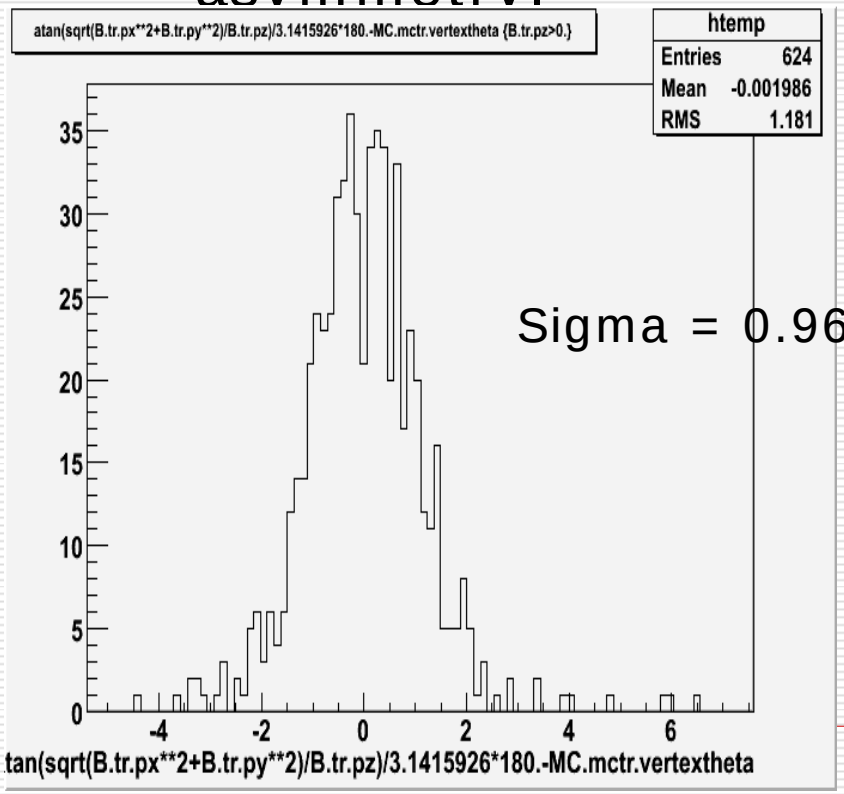




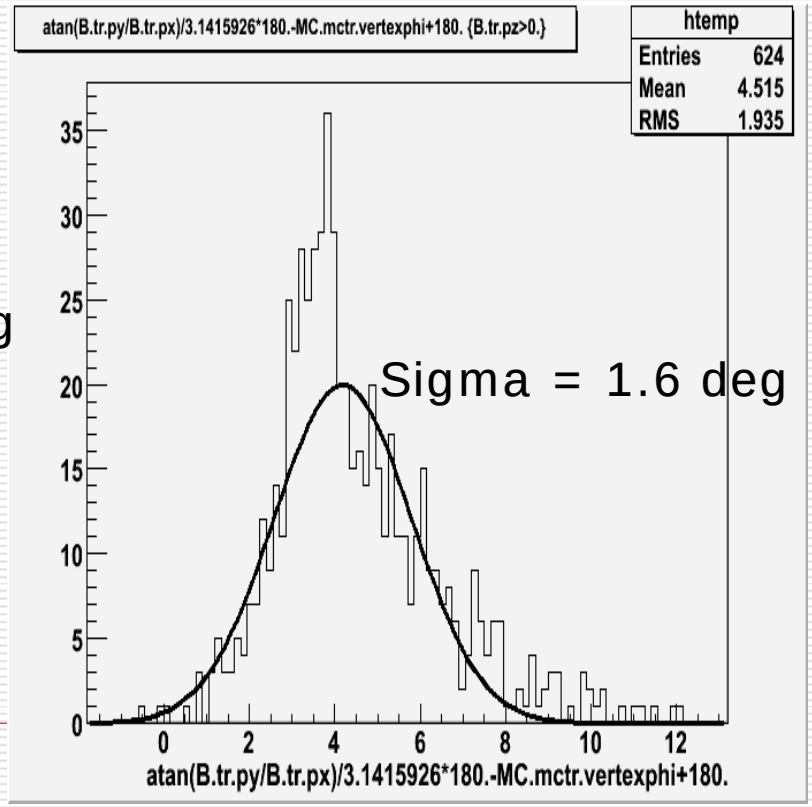
Vertical position at first plane

Most important, out-of-plane angle

- Central concept: separate Collins/Sivers asymmetry.
- Software can be tested using MC.



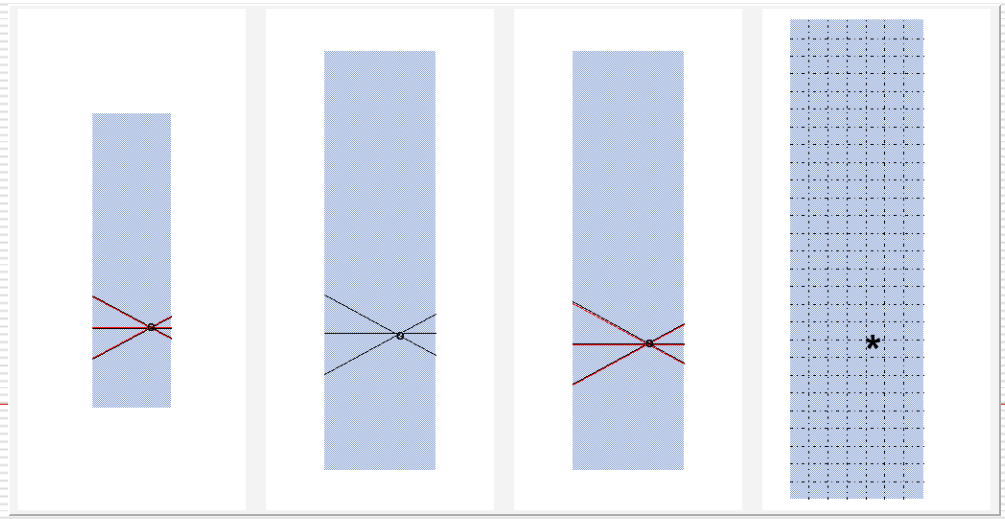
Theta



Phi

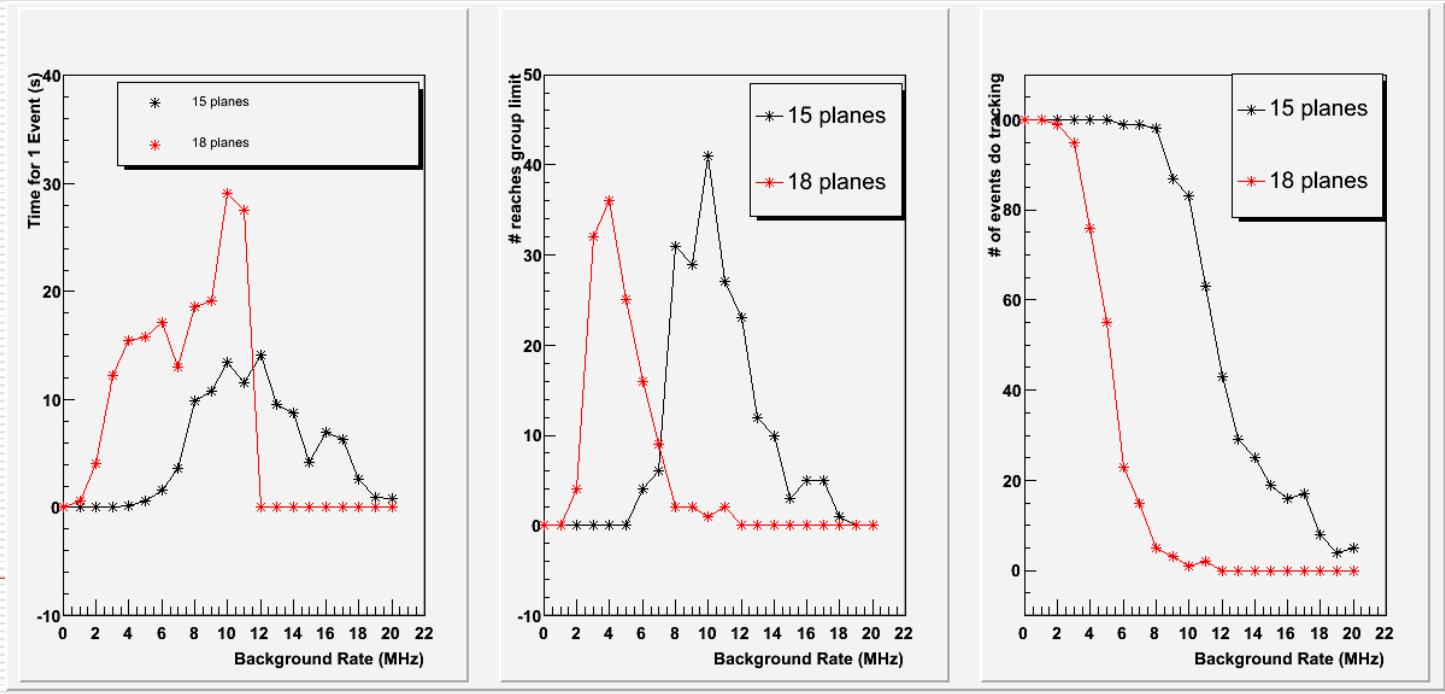
Why do we need a new tracking Al?

- No shower cut at this point.
  - Have not figured out how to use it.
  - Wide momentum range weaken the usefulness of this cut.
  - Compared with 15 planes situation (GEN)



Why do we need a new tracking Algorithm?

- Maxcall = 10000000
- Hard (soft) group = 500000 (300000)
- 10 times more than GEN standard setting.
- No Shower Cut yet !



Why do we need a new tracking algorithm?

- With wide momentum coverage
  - How well can shower cut clean the background?
    - Can be studied using this MC
  - Serious situation – 4MHz runing limit without shower cut which is corresponding to 3 uA with 18 planes.
  - On the other hand, we can step back to 15 planes or even 12 planes
    - Moderate requirement on momentum resolution
    - However, stronger requirement on out-of-plane angle
    - Faked track → Possible False Asymmetry, Dilution factor, etc
    - May be studied partially by MC

Conclusion

- Chamber 1 + Chamber 3 test done
- Chamber 1 is broken after test
- Chamber 2 preparation work is under progress, man-power are very welcome.
- Tracking MC is done, additional features, like wire cross-talk can be added.
  - A powerful tool to test BB related software
  - A powerful tool to study optics.
  - A good new tracking algorithm are urgently needed (Xin's opinion)

Future Plan

- Need to go into the tracking code to set the running luminosity with existing tracking software.
  - Shower cut
  - Target transition matrix etc.
  - Improved version of tracking code?
  - Other possibilities, like less plane option?
- Optics – out-of-plane angle resolution.
- Move on to chamber-2 preparation work. Man power are very welcome.

Acknowledgement

- R. Feuerbach
- O. Hansen
- X. Jiang

  - For helpful discussion